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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/815,276
Filing Date: April 01, 2004
Appellants: MCALLISTER ET AL.

Donald F. Haas
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11 June 2009 appealing from the Office Action mailed 29 September 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 4,645,754	TAMURA et al.	02-1987
US 4,511,671	SAITO et al.	04-1985
US 4,358,623	MURPHY et al.	11-1982

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4, 8-14, 19, 21-23, 27-33, and 37-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 4,645,754) in view of Saito (US 4,511,671). Alternatively, claims 1-4, 8-14, 19, 21-23, 27-33, and 37-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 4,645,754) in view of Saito (US 4,511,671), as evidenced by Murphy (US 4,358,623).

5. With respect to claim 1, Tamura discloses a reactor system for the oxidation of ethylene to ethylene oxide comprising: an elongated tube, having a reaction zone defined by a tube length and a tube diameter, wherein the tube diameter may be greater than 28 mm (see Tamura, column 13, lines 58-60); wherein contained within the reaction zone is a packed bed of shaped support material (see Tamura, Figs. 7-12); and wherein the shaped support material has a hollow cylinder geometric configuration (see Tamura, Figs. 7-12) defined by a nominal length, an outside diameter and an inside diameter such that the ratio of the length to the outside diameter is in the range of from about 0.5 to about 2 (see Tamura, column 12 (Example 3, Control 1)), and further such

that the ratio of the outside diameter to the inside is about 2.3 (see Tamura, column 12 (Example 3, Control 1)), and the ratio of the tube diameter to the outside diameter is in the range of from about 2 to about 10 (see Tamura, column 11, lines 51-53; and column 12 (Example 3, Control 1)).

Tamura does not explicitly disclose wherein the ratio of the outside diameter to the inside diameter exceeds about 2.7; or wherein the outside diameter is in the range of from about 7.4 mm to about 11.6 mm.

However, Saito discloses a process for the catalytic vapor phase oxidation of isobutylene over a hollow cylinder catalyst support (i.e. the same type used by Tamura), wherein the ratio of outside diameter to inside diameter exceeds about 2.7 (see e.g., Tamura, column 2, lines 17-20; and Example 4) and wherein the outside diameter is in the range of from about 7.4 mm to about 11.6 mm (see Saito, column 2, lines 17-20; and Example 5). Saito explains that by using catalysts having the disclosed dimensions, it is possible to reduce the catalyst particle size and increase the geometric surface area thereby achieving a higher catalyst activity and a higher yield (see Saito, column 2, lines 46-50). Saito also notes a reduced pressure drop across a bed of catalysts comprising his disclosed dimensions (see Saito, column 1, lines 29-32; and column 2, lines 58-62).

Therefore, the person having ordinary skill in the art of reactor systems for the oxidation of ethylene would have been motivated to use catalyst support materials of the type disclosed by Saito in the process of Tamura in order to achieve higher catalyst

activity and higher yield while maintaining a reduced pressure drop across the catalyst bed.

Finally, the person having ordinary skill in the art of reactor systems for the oxidation of ethylene would have had a reasonable expectation of success in using the catalyst support materials of Saito in the process of Tamura because: (1) both Tamura and Saito are directed to the vapor phase oxidation of olefins (alkenes); (2) both Tamura and Saito disclose the use of hollow cylinder catalyst support materials; (3) Tamura notes a concern with high pressure losses associated with the use of hollow cylinder catalyst support materials (see Tamura, column 3, lines 29-40); and (4) Saito discloses hollow cylinder catalyst support materials formed with specific dimensions that would alleviate the pressure drop concerns noted by Tamura.

6. With respect to claims 2 and 3, Tamura discloses wherein the tube diameter may be about 33 mm (see Tamura, column 13, lines 58-60); and Saito discloses wherein the ratio of outside diameter to inside diameter is in the range of from about 3.3 to about 10 (see Saito, Example 4).

7. With respect to claim 4, the court has held that where the only difference between the prior art and the claims at issue are a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform any differently than the prior art device, the claimed device is not patentably distinct from that of the prior art. See MPEP § 2144.04 (IV)(A) (citing *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984)).

8. With respect to claim 8, Tamura discloses wherein the tube length may be 10 meters (see Tamura, column 13, lines 58-60).

9. With respect to claim 9, Saito discloses wherein the reaction tube is *filled* with catalyst having a hollow cylindrical geometric configuration (see Saito, column 4, lines 21-22).

10. With respect to claims 10 and 11, Tamura discloses wherein the ratio of tube diameter to outside diameter is in the range of from about 3 to about 5 (see Tamura, column 11, lines 51-53; and column 12 (Example 3, Control 1)).

11. With respect to claims 12-14, Tamura discloses wherein the shaped support material comprises predominantly alpha-alumina (see Tamura, column 5, lines 53-59), and the packed bed has a tube packing density of greater than about 550 kg per cubic meter (see Tamura, Table 1); and wherein the shaped support material supports silver as a catalytic component (see Tamura, Example 1; and Example 3 (Control 1)).

12. With respect to claim 19, Tamura discloses a reactor system for the oxidation of ethylene to ethylene oxide comprising: an elongated tube, having a reaction zone defined by a tube length and a tube diameter, wherein the tube diameter may be greater than 28 mm (see Tamura, column 13, lines 58-60); wherein contained within the reaction zone is a packed bed of shaped support material (see Tamura, Figs. 7-12); and wherein the shaped support material has a hollow cylinder geometric configuration (see Tamura, Figs. 7-12) defined by a nominal length, an outside diameter and an inside diameter such that the ratio of the length to the outside diameter is in the range of from about 0.5 to about 2 (see Tamura, column 12 (Example 3, Control 1)), and further such

that the ratio of the outside diameter to the inside is about 2.3 (see Tamura, column 12 (Example 3, Control 1)), and the ratio of the tube diameter to the outside diameter is in the range of from about 2 to about 10 (see Tamura, column 11, lines 51-53; and column 12 (Example 3, Control 1)).

Tamura does not explicitly disclose wherein the ratio of the outside diameter to the inside diameter exceeds about 2.7; wherein the outside diameter is in the range of from about 7.4 mm to about 11.6 mm; or wherein the ratio of the nominal outside diameter to the nominal inside diameter provides a positive test, wherein "positive test result" is defined by a decrease of the quotient of a numerical value of the pressure drop per unit length of the packed bed and a numerical value of the packing density, which numerical values are obtained by testing the packed bed in a turbulent flow of nitrogen gas at a pressure of 1.136 MPa (150 psig), relative to a comparison quotient of numerical values obtained in an identical manner, except that the hollow cylinder geometric configuration of the same support material is defined by a nominal outside diameter of 8 mm and a nominal inside diameter of 3.2 mm, and a ratio of the nominal length to the nominal outside diameter of 1.

However, Saito discloses a process for the catalytic vapor phase oxidation of isobutylene over a hollow cylinder catalyst support (i.e. the same type used by Tamura), wherein the ratio of outside diameter to inside diameter exceeds about 2.7 (see e.g. Tamura, column 2, lines 17-20; and Example 4), and wherein the outside diameter is in the range of from about 7.4 mm to about 11.6 mm (see Saito, column 2, lines 17-20; and Example 5). Saito explains that by using catalysts with the disclosed dimensions, it

is possible to reduce the catalyst particle and increase the geometric surface area thereby achieving a higher catalyst activity and a higher yield (see Saito, column 2, lines 46-50). Saito also notes a reduced pressure drop across a bed of catalysts comprising his disclosed dimensions (see Saito, column 1, lines 29-32; and column 2, lines 58-62). Moreover, it is known in the art that pressure drop across a packed bed is a function of packing density (see e.g. Murphy (US 4,358,623), column 3, lines 50-53). In other words, packing density is a "result-effective variable," changes in which will necessarily result in corresponding changes in pressure drop per unit length of a packed bed. Therefore, Examiner finds Applicant's limitation "wherein the ratio of the nominal outside diameter to the nominal inside diameter provides a positive test, wherein 'positive test result' is defined by a decrease of the quotient of a numerical value of the pressure drop per unit length of the packed bed and a numerical value of the packing density, which numerical values are obtained by testing the packed bed in a turbulent flow of nitrogen gas at a pressure of 1.136 MPa (150 psig), relative to a comparison quotient of numerical values obtained in an identical manner, except that the hollow cylinder geometric configuration of the same support material is defined by a nominal outside diameter of 8 mm and a nominal inside diameter of 3.2 mm, and a ratio of the nominal length to the nominal outside diameter of 1" to be of no patentable consequence since a person having ordinary skill in the art and having an appreciation for Tamura could easily meet such limitation through mere routine experimentation. See MPEP § 2144.05(II).

Therefore, the person having ordinary skill in the art of reactor systems for the oxidation of ethylene would have been motivated to use catalyst support materials of the type disclosed by Saito in the process of Tamura in order to achieve higher catalyst activity and higher yield while maintaining a reduced pressure drop across the catalyst bed.

Finally, the person having ordinary skill in the art of reactor systems for the oxidation of ethylene would have had a reasonable expectation of success in using the catalyst support materials of Saito in the process of Tamura because: (1) both Tamura and Saito are directed to the vapor phase oxidation of olefins (alkenes); (2) both Tamura and Saito disclose the use of hollow cylinder catalyst support materials; (3) Tamura notes a concern with high pressure losses associated with the use of hollow cylinder catalyst support materials (see Tamura, column 3, lines 29-40); and (4) Saito discloses hollow cylinder catalyst support materials formed with specific dimensions that would alleviate the pressure drop concerns noted by Tamura.

13. With respect to claims 21 and 22, Tamura discloses wherein the tube diameter may be about 33 mm (see Tamura, column 13, lines 58-60); and Saito discloses wherein the ratio of outside diameter to inside diameter is in the range of from about 3.3 to about 10 (see Saito, Example 4).

14. With respect to claim 23, the court has held that where the only difference between the prior art and the claims at issue are a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform any differently than the prior art device, the claimed device is not patentably

distinct from that of the prior art. See MPEP § 2144.04 (IV)(A) (citing *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984)).

15. With respect to claim 27, Tamura discloses wherein the tube length may be 10 meters (see Tamura, column 13, lines 58-60).

16. With respect to claim 28, Saito discloses wherein the reaction tube is *filled* with catalyst having a hollow cylindrical geometric configuration (see Saito, column 4, lines 21-22).

17. With respect to claims 29 and 30, Tamura discloses wherein the ratio of tube diameter to outside diameter is in the range of from about 3 to about 5 (see Tamura, column 11, lines 51-53; and column 12 (Example 3, Control 1)).

18. With respect to claims 31-33, Tamura discloses wherein the shaped support material comprises predominantly alpha-alumina (see Tamura, column 5, lines 53-59), and the packed bed has a tube packing density of greater than about 550 kg per cubic meter (see Tamura, Table 1); and wherein the shaped support material supports silver as a catalytic component (see Tamura, Example 1; and Example 3 (Control 1)).

19. With respect to claims 37-43, Applicant's claimed dimensions for the hollow cylinder support's outside and inside diameters all lie within or touch the disclosed range of dimensions for Saito's hollow cylinder support (see Saito, column 2, lines 17-20). In this regard, Examiner notes that when claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists. See MPEP § 2144.05 (I) (citing *In re Wertheim*, 541 F.2d 257 (CCPA 1976)).

(10) Response to Argument

Appellant's arguments on pages 3 and 4

Appellant argues on pages 3 and 4 of the brief that the "test result" obtained and explained in the McAllister declaration establishes a truly unexpected result in light of what would have been predicted for pressure drop by a commonly accepted scientific correlation known as the Ergun Correlation.

In response to Appellant's argument, Examiner notes that the McAllister declaration (filed 7 February 2008) is not directly responsive to the instant rejection as it was submitted in response to a 35 U.S.C. 103(a) rejection of Appellant's claims based on Saito (US 4,511,671) as the primary reference. In contrast, the instant rejection uses Tamura (US 4,645,754) as the primary reference in a 35 U.S.C. 103(a) rejection of Appellant's claims.

In any event, Examiner submits that the McAllister declaration does *not* establish unexpected results sufficient to overcome the rejection of Appellant's claims. In order for a showing of "unexpected results" to be probative evidence of nonobviousness, it falls upon the applicant to at least establish: (1) that there actually is a difference between the results obtained through the claimed invention and those of the prior art; and (2) that the difference actually obtained would not have been expected by one skilled in the art at the time of the invention. *In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973). Objective evidence of nonobviousness must be commensurate in scope with the claims. *In re Linder*, 457 F.2d 506, 508 (CCPA 1972). Furthermore, an applicant relying on comparative tests to rebut a *prima facie* case of obviousness must

compare the claimed invention to the closest prior art. *In re DeBlawe*, 736 F.2d 699, 705 (Fed. Cir. 1984). In this case, Appellant has merely compared the "test result" to that predicted by the Ergun Correlation (a mathematical formula). Appellant has *not* compared the "test result" to the closest prior art (Tamura). Thus, Appellant has not properly established "unexpected" results over the *prior art*. *See In re DeBlawe*.

Appellant's argument on page 6

Appellant argues on page 6 of the brief that the oxidation reaction of Saito is a diffusion-limited reaction whereas the ethylene epoxidation reaction is not. Thus, Appellant urges that there are different considerations to be taken into account for a diffusion-limited reaction than for the reaction of the claimed invention.

In response to Appellant's argument, Examiner submits that such argument is irrelevant inasmuch as the primary reference (Tamura) is directed to the same ethylene epoxidation reaction system as claimed. Moreover, such argument is unpersuasive inasmuch as Appellant's claims are directed to a "*system*" (i.e. *apparatus*) and *not* a *process*. Finally, Examiner notes that both Tamura and Saito: (1) relate generally to reaction systems for the gas phase oxidation of olefins; (2) use packed tubular reactors; and (3) use the same or similar catalyst support materials.

Appellant's argument on page 7

Appellant argues on page 7 of the brief that because Saito and Tamura concern different types of reaction systems, one would not be lead to combine the specific geometry and size limitations of Saito with the disclosure of Tamura.

In response to Appellant's argument, Examiner submits that such argument is irrelevant inasmuch as the primary reference (Tamura) is directed to the same ethylene epoxidation reaction system as claimed. Moreover, such argument is unpersuasive inasmuch as Appellant's claims are directed to a "*system*" (i.e. *apparatus*) and *not* a *process*. Finally, Examiner notes that both Tamura and Saito: (1) relate generally to reaction systems for the gas phase oxidation of olefins; (2) use packed tubular reactors; and (3) use the same or similar catalyst support materials.

Saito explains that by using catalysts having the disclosed dimensions, it is possible to reduce the catalyst particle size and increase the geometric surface area thereby achieving a higher catalyst activity and a higher yield (see Saito, column 2, lines 46-50). Saito also notes a reduced pressure drop across a bed of catalysts comprising his disclosed dimensions (see Saito, column 1, lines 29-32; and column 2, lines 58-62). Therefore, the person having ordinary skill in the art of reactor systems for the oxidation of ethylene would have been motivated to use catalyst support materials of the type disclosed by Saito in the process of Tamura in order to achieve higher catalyst activity and higher yield while maintaining a reduced pressure drop across the catalyst bed.

Appellant's argument on pages 7 and 8

Appellant argues on pages 7 and 8 of the brief that: (1) the skilled person would not have been motivated to use the catalyst support materials of the type disclosed in Saito in the ethylene epoxidation process of Tamura in order to maintain a reduced pressure drop across the catalyst bed since the improved pressure drop in Saito is in comparison to solid spheres or cylinders and not the saddles of Tamura; and (2) Tamura clearly discloses that Intalox or Berl saddles are considered superior to Raschig rings (hollow cylinders), and thus teaches away from the claimed invention.

In response to Appellant's argument, Examiner notes that Tamura does express a preference for Intalox or Berl saddle catalyst supports rather than Raschig ring supports (see Tamura, column 3, lines 31-40; and column 4, lines 35-45). However, Tamura's Examples (see Table 2, *compare* Example 8 *with* Controls 6 and 8; and Table 3, *compare* Example 12 *with* Controls 11 and 13) show that catalyst supports in the shape of Raschig rings are nevertheless suitable for use in his process, even if not preferred – i.e. the use of Raschig rings support would *not* destroy the operability of Tamura's process or reaction system. Indeed, Tamura's own results show that in some instances Raschig ring supports perform comparable (or even *superior*) in terms of catalyst selectivity and pressure loss when compared to the preferred Intalox and Berl saddle catalyst supports (see e.g., Tamura, Table 2, *compare* Control 8 *with* Example 8) (showing *higher* selectivity and *lower* pressure loss achieved with a Raschig ring support (Control 8) than was obtained with an Intalox saddle support (Example 8) for the same reaction conditions)).

Appellant's argument on page 8

Appellant argues on page 8 of the brief that the McAllister declaration establishes that the tube diameter of Saito (25.4 mm) is of industrial scale and that one of ordinary skill would scale-up Saito's system by increase in the number of tubes used rather than by increasing the individual tube diameter.

In response to Appellant's argument, such argument is irrelevant inasmuch as the primary reference (Tamura) discloses a tube diameter of 33 mm (see Tamura, column 13, lines 58-60) which meets the limitation of the independent claims "the tube diameter being at least 28 mm."

In addition, Examiner notes that Saito alone appears to meet all the limitations of independent claim 1 *except* for the tube diameter being at least 28 mm – Saito's tube diameter is 25.4 mm (see Saito, column 4, lines 21-22). However, where the difference between the prior art and the claims at issue are merely a recitation of relative dimensions of the claimed device, and a device having the claimed dimensions would not perform differently than that of the prior art, then the claimed device is not patentably distinct from that of the prior art. See MPEP § 2144.04(A) (citing *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984)). Thus, Saito *alone* would seem to render obvious at least Appellant's independent claim 1. In this regard, Examiner notes that the claim preamble language "for the oxidation of ethylene to ethylene oxide" is merely a statement of intended use that does not impart any structural difference to the claimed *apparatus*. See MPEP §§ 2111.02 ("During examination, statements in the

preamble reciting the purpose or intended use of the claimed invention must be evaluated to determine whether the recited purpose or intended use results in a structural difference . . . between the claimed invention and the prior art."), 2114 ("While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function."). Again, Examiner notes that the McAllister declaration does not properly establish "unexpected" results over the prior art because it merely compares the "test result" to that predicted by the Ergun Correlation (a mathematical formula). Appellant has *not* compared the "test result" to the closest prior art (whether considering Tamura *or* Saito to be the closest prior art). *See In re DeBlawe*.

Appellant's argument on page 8

Appellant argues on page 8 of the brief that Murphy adds nothing helpful to Examiner's position.

In response to Appellant's argument, Examiner notes that Murphy serves as evidence that pressure drop across a packed bed is a function of packing density (see Murphy, column 3, lines 50-53). In other words, packing density is a "result-effective variable," changes in which will *necessarily* result in corresponding changes in pressure drop per unit length of a packed bed.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Randy P. Boyer

/Randy P. Boyer/

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